Section: Pediatrics

Original Research Article

TO COMPARE THE EFFICACY OF UMBILICAL CORD BLOOD CULTURE (UCBC) V/S VENOUS BLOOD CULTURE IN DIAGNOSIS OF EARLY ONSET SEPSIS IN NEONATES

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ABSTRACT

Background: Neonatal mortality is increasingly recognized as an important global public health challenge that must be addressed if we are to reduce child health disparities between rich and poor countries. Neonates constitute the nation's foundation and mothers are its pillars and no one can afford to neglect their needs and rights"- UNICEF. Neonatal period is considered the most important age group at all times as newborns are most susceptible to diseases and death. Historically the probability of death during neonatal period was so high that many traditional practices were postponed until after first week of life, ensuring the probability of child's survival. Also, the quality of life and health as the child grows to adult life is partly determined at this stage. Neonatal sepsis is the most common cause of neonatal mortality. AIM: To compare the efficacy of Umbilical cord blood culture (UCBC) v/s venous blood culture in diagnosis of early onset sepsis in neonates.

Material and Methods: This was a hospital based Observational comparative type of study carried out in neonatology unit of department of Pediatrics, Dr BVPRMC, PIMS (DU) Loni. Study was carried out for the period of 3 years (March 2021 to March 2024). Total 68 cases were studied. Results were compiled and appropriate analysis was done.

Results: Majority were female child (58.82%). On inspecting maternal risk factors it was seen that 8.9% were previous low birth weight and 14.8% had Rh negative status. On Presence of risk factors for sepsis majority 79.41% were multiple times examined per vaginally, followed by 36.8% had foul smelling liquor, 11.8% had febrile illness and 5.8% had birth asphyxia. On umbilical cord blood culture, most common microorganism identified was Staphylococcus aureus 11.7%, followed by 8.8% Pseudomonas Species.

Conclusion: Umbilical cord blood culture collection is simple and convenient. It can be used as a tool for early diagnosis of neonatal sepsis. Organisms grown are comparable in both UCBC and venous blood culture sample.

Keywords: Umbilical cord blood culture (UCBC), venous blood culture, diagnosis, early onset sepsis, neonates.

INTRODUCTION

Neonates constitute the nation's foundation and mothers are its pillars and no one can afford to neglect their needs and rights"- UNICEF. Neonatal period is considered the most important age group at all times as newborns are most susceptible to diseases and death. Historically the probability of death during neonatal period was so high that many traditional

practices were postponed until after first week of life, ensuring the probability of child's survival. Also, the quality of life and health as the child grows to adult life is partly determined at this stage. Neonatal sepsis is the most common cause of neonatal mortality. It accounts for nearly 3 million neonatal deaths per year and an estimated neonatal mortality rate of 23. 9 per 1000 live births globally.[1] About 2% of foetuses are infected in utero and up to 10% of infants have infections in the 1st month of life.[2] Because sick newborns present with nonspecific signs and symptoms, a clinical diagnosis of neonatal sepsis is difficult in even the most sophisticated settings. Many factors contribute to the high mortality due to infections, including under-recognition of illness, delay in care seeking at the household level, and lack of access to both appropriately trained health workers and to high quality services to manage sepsis. Even if quality services are available, the cost of treatment is beyond the reach of many families. It is particularly poignant that many neonatal deaths occur in the community, without the new born ever having contact with the appropriate health services.[3] Previous studies have suggested safety and reliability of umbilical cord blood culture (UCBC) for sepsis evaluation in asymptomatic term infants and for universal screening of early onset sepsis in newborns with maternal risk factors. Increased positivity on UCBC (~20 to 47%) in high risk newborns has also been demonstrated.[4]

AIM: To compare the efficacy of Umbilical cord blood culture (UCBC) v/s venous blood culture in diagnosis of early onset sepsis in neonates.

MATERIALS AND METHODS

This was a hospital based Observational comparative type of study carried out in neonatology unit of department of Pediatrics, Dr BVPRMC, PIMS (DU), Loni. Study was carried out for the period of 3 years (March 2021 to March 2024). Total 68 cases were studied. The participants were included in the study only after informed consent which were taken in vernacular language.

Inclusion Criteria

Singleton Neonates delivered in PRH with birth weight >1500gm and >32 weeks who are at risk of developing EOS based of presence of two or more risk factor such as:

1) Preterm
2) Low birth weight
3) Premature or prolong rupture of membrane (>18hrs)
4) Prolong Labour (>24 hrs both stages) and difficult delivery with instrumentation
5) Febrile illness in the mother during or within two weeks of delivery
6) Meconium foul smelling and/or Meconium stained liquor Amnii
7) Birth Asphyxia
8) UTI
9) Fetal distress
10) Single unclean or more than three vaginal Examination during labour

Exclusion Criteria

1) Baby weight <1500gm
2) Gestational age <32 weeks
3) Baby without above risk Factors
4) Outborn Babies

Method of umbilical cord blood collection: The umbilical cord was clamped at the placental side and the infant side. Thereafter the cord was cut and handed over to the nurse. The cord was wipe three times with 70% isopropyl alcohol using sterile technique. Using a sterile 22-gauge needle and syringe, approximately 2 mL of blood was drawn into the syringe from the umbilical vein or artery from placental end. Syringe was replaced with a new sterile needle and the top of culture bottle was wiped with alcohol. Then 2 mL of blood was injected in an aerobic blood culture bottle and send to the laboratory under all aseptic precaution.

- With all aseptic precautions venous blood culture and routine hematological and biochemical testing such as Complete blood counts with differentials, CRP was done in 1st hour of life
- Neonate was observed for development of any sign of sepsis
- All the results were recorded, tabulated and analyzed using Microsoft excel and statistical tools.

RESULTS

Newborn Examination

Table 1: General examination

Parameter	Mean	SD
RR/min	48.29	6.48
HR/ min	141	11.08
SPO2 (RUL)	97.5	0.81
SPO2(LUL)	97.2	0.89
Temperature	98.21	0.22

Table 2: Physical examination

Parameter	Present	Absent
Pallor	2	66

Cyanosis	1	67

Only 3 cases had pallor and cyanosis.

Table 3: Laboratory investigation

Parameter	Mean	SD
Hb	18.31	2.2
TLC	11436.8	5695.2
Neutrophil	52.56	16.9
Monocyte	10.53	8.16
Lymphocyte	32.35	17.88
Eosinophil	2.31	2.77
Basophil	0.05	2.23
Platelet count	245.88	60.11
PCV	56.84	7.04
ESR	8.32	5.26

Table 4: CRP investigation

CRP	Count
NEGATIVE	61
POSITIVE	7

Only 7 new-born showed raised CRP levels.

Table 5: Umbilical cord blood culture

Umbilical cord blood culture	Count	Percentage
ACINETOBACTER	2	2.9%
CANDIDA SPECIES	1	1.4%
COAGULASE-NEGATIVE STAPHYLOCOCCI	2	2.9%
CONTAMINANT GROWTH(gram positive aerobic bacilli)	3	4.4%
KLEBSIELLA OXYTOCA	1	1.4%
PSEUDOMONAS SPECIES	6	8.8%
STAPHYLOCOCCUS AUREUS	8	11.7%
STREPTOCOCCUS	1	1.4%
STERILE	44	64%

Table 6: Venous blood culture

Venous blood culture	Count	Percentage
ACINETOBACTER	3	4.4%
COAGULASE NEGATIVE STAPHYLOCOCCI	2	2.9%
CONTAMINANT GROWTH	3	4.4%
ENEROCOCCUS SPECIES	1	1.4%
PSEUDOMONAS SPECIES	4	5.8%
STAPHYLOCOCCUS AUREUS	5	7.3%
STERILE	50	73%

Table 7: Association between PVBC and UCBC

PVBC	UCBC		Total
	Positive	Negative /sterile	
Positive	14	4	18
Negative /sterile	10	40	50
Total	24	44	68

Sensitivity- 58.33%
Specificity- 90.91%
Positive Predictive Value- 77.78%
Negative Predictive Value- 80%
Diagnostic Accuracy- 79.41%

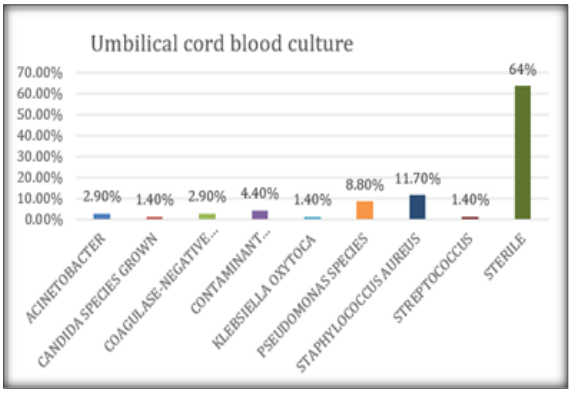

Figure 1: Umbilical cord blood culture

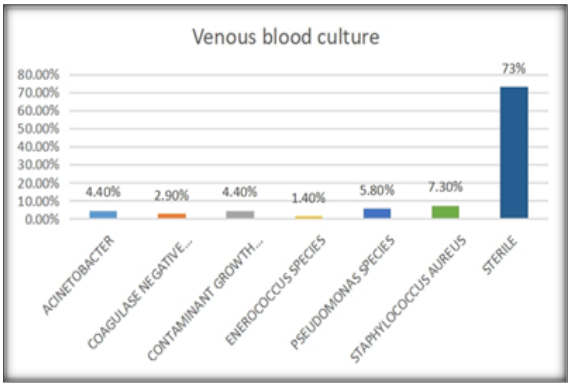

Figure 2: Venous blood culture

DISCUSSION

Majority were female child (58.82%). On inspecting maternal risk factors it was seen that 8.9% were previous Low birth weight and 14.8% had Rh negative status. On Presence of risk factors for sepsis majority 79.41% were multiple times examined per vaginally, followed by 36.8% had foul smelling liquor, 11.8% had febrile illness and 5.8% had birth asphyxia. On umbilical cord blood culture, most common microorganism identified was Staphylococcus aureus 11.7%, followed by 8.8% Pseudomonas Species.

Study by Jain P et al,[3] showed that isolated organism on UCBC positive neonates was Klebsiella (57.6%), followed by Staphylococcus aureus (23%), Escherichia coli (15.3%). • Similarly, In PVBC positive neonates Klebsiella (52.3%) was most commonly isolated organism. Staphylococcus (23.8%) was the next most common followed by Escherichia coli (14.2%). The higher sensitivity (81.0%), specificity (88.6%) and accuracy (87%) for predicting disease outcome of patients by UCBC method against PVBC Method conclude that UCBC can be used as reliable and alternate tool to predict the final outcome. Similar outcome was seen in present study as well as studies by Hansen et al,[5] Costakos et al,[6] Fos et al,[7] etc.

In present study on umbilical cord blood culture, most common microorganism identified was Staphylococcus aureus 11.7%, followed by 8.8% Pseudomonas Species, similar study by Bhat et al,[8] showed 90.8% organisms were gram-negative and commonest organism were Pseudomonas (33.2%), Klebsiella (31.2%), Acinetobacter (14.4%), and E. coli (4.4%). In a study by Chacko and Sohi,[9] Pseudomonas was found in 60% culture positive sepsis, followed by Klebsiella (13%) S. aureus (13%), and E. coli (7%). Other study of Pais et al,[10] suggested that commonest organism growth was of pseudomonas in early-onset sepsis (11.46%).

Study by Mandot S et al,[11] also conducted a similar type of study and found 100% sensitivity and 73.08% specificity. Study by S Mutalik et al,[12] showed that although peripheral venous blood culture is the gold standard for the diagnosis of early-onset sepsis (EOS), the accuracy of diagnosis is limited by low sensitivity usually due to small volume of blood sample, use of intrapartum antibiotics, and antibiotics administered to neonates before sampling and found diagnostic accuracy of 85%.

CONCLUSION

Umbilical cord blood culture collection is simple and convenient. It can be used as a tool for early diagnosis of neonatal sepsis. Organisms grown are comparable in both UCBC and venous blood culture sample. Thus, such test should be added in SOPs of at risk mother and newborn so as to achieve early diagnosis and treatment of the disease.

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